

March 29, 2024

By email:

Arlington Land Trust, Inc.  
Attn: Chris Leich  
P.O. Box 492  
Arlington, MA 02476  
[cmleich@comcast.net](mailto:cmleich@comcast.net)

**RE: Proposed Residential Development, Dorothy Road, Arlington, Massachusetts  
Request for Preliminary Review of Applicant's Frimpter Analysis**

Dear Mr. Leich,

In response to your request, McDonald Morrissey Associates, LLC (MMA) has completed a preliminary review of the Frimpter analysis presented by the Applicant's consultant BSC Group (BSC) in their February 28, 2024 letter to the Arlington Conservation Commission<sup>1</sup>. Through this review, we discovered the following issues:

- **Issue 1 – OWc (Current groundwater level at the index well)** – The values for OWc should reflect the groundwater depth reported at the index well at a time corresponding to the groundwater depth observation made at the test site (e.g., a test pit). According to BSC<sup>2</sup>, the test pits in question were performed—and the corresponding groundwater depths were observed—during May 18, 2023, and May 19, 2023. The U.S. Geological Survey reports daily mean depths to groundwater at the utilized index well (i.e., MA-LTW in Lexington, Massachusetts) of 2.59 feet and 2.61 feet during May 18, 2023 and May 19, 2023, respectively. However, BSC's Frimpter analysis strangely uses OWc values of 2 feet for test pits TP-1, TP-2, TP-4, and TP-7 and 2.5 feet for test pit TP-8. The apparently erroneously low OWc values used by BSC cause the Frimpter analysis to produce low-biased adjusted estimated seasonal high groundwater (ESHGW) elevations.

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<sup>1</sup> Letter to the Town of Arlington Conservation Commission from Dominic Rinaldi of BSC Group, *RE: Response to Additional Peer Review Comments and Questions from the Commission, Thorndike Place Stormwater Peer Review*. Dated February 28, 2024.

<sup>2</sup> Letter to the Town of Arlington Conservation Commission from Dominic Rinaldi of BSC Group, *RE: Test Pit Summary Report, Thorndike Place Stormwater Peer Review*. Dated March 13, 2024.

- **Issue 2 – Sr (Annual range at the test site)** – The Sr value is intended to represent a conservative estimate of the potential annual range in groundwater level at the test site in question. In applying the Frimpter technique, the Sr value is selected based on statistical analyses of historically monitored wells in similar geologic and topographical settings. After isolating the analysis that matches the setting of the test site in question, a conservative value (e.g., the groundwater level range that is exceeded by 5% of considered sites) is selected. BSC selected a value of 4.2 feet based on a “sand and gravel in valley flats” setting for test pits TP-1, TP-2, TP-4, and TP-7 based on the original study authored by Michael Frimpter of the U.S. Geological Survey in 1981 that considered data from 16 wells<sup>3</sup>. An update to the original Frimpter study, published by the U.S. Geological Survey in 2020, expanded the number of evaluated wells in this setting (i.e., referred to as “stratified drift, valley”) to 41. The updated analysis and additional data resulted in an increase to the 5% exceedance condition that would increase the Sr value from 4.2 feet to 7.1 feet. Use of an updated—and larger in magnitude—Sr value in the Frimpter analysis would result in higher ESHGW elevations compared to the calculations presented by BSC.
- **Issue 3 – Sr (Annual range at the test site)** – BSC selected an Sr value of 2 feet for test pit TP-8. This value appears to be an erroneous input, as it does not match the outdated or updated Sr values described above in relation to Issue 2. Again, using a larger Sr value in the Frimpter analysis will result in a higher ESHGW elevation compared to the calculations presented by BSC.

The effect of correcting the issues highlighted above is demonstrated by revising the Frimpter analysis under the following correction scenarios:

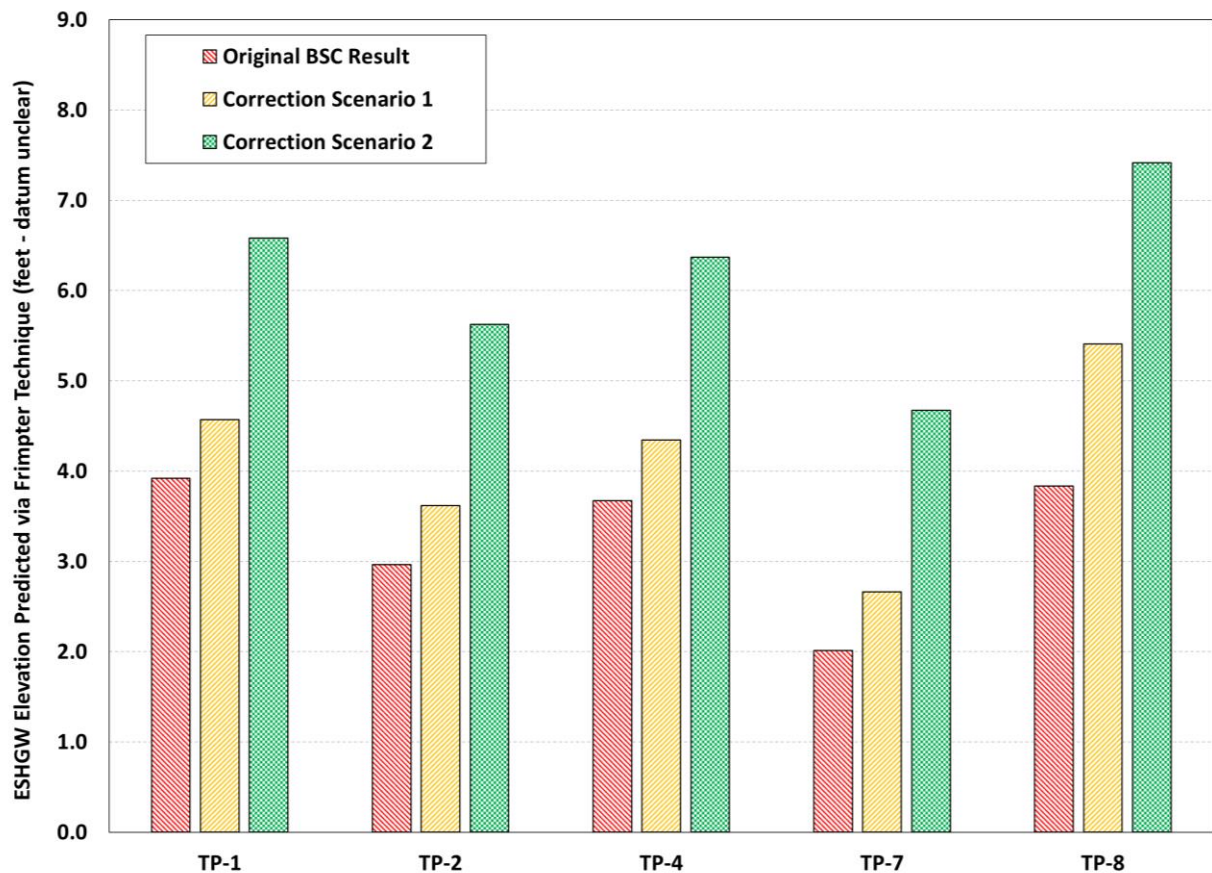
**Correction Scenario 1:** Address Issue 1 by using daily mean groundwater depths reported by the U.S. Geological Survey at index well MA-LTW on test pit completion dates, and address Issue 3 by making the Sr value consistent with the value used for other test pits (i.e., the outdated value of 4.2 feet).

**Correction Scenario 2:** Modify Correction Scenario 1 to include an Sr value of 7.1 feet based on the updated U.S. Geological Survey study.

The results produced under Correction Scenarios 1 and 2 are compared to the original results reported by BSC in the following figure:

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<sup>3</sup> Frimpter, Michael H. *Probable High Ground-Water Levels in Massachusetts*. U.S. Geological Survey Water Resources Investigations Open-File Report 80-1205. March 1981.  
<https://pubs.usgs.gov/of/1980/1205/report.pdf>



As evidenced by the figure above, when the issues identified through MMA's review are addressed through revision, the Frimpter analysis predicts significantly and consequentially higher ESHGW elevations at all of the considered test pits. For most test pits, the degree of difference relative to the original BSC estimates indicates the resultant ESHGW elevation is more sensitive to (i.e., increases more due to) the  $S_r$  value basis highlighted under Issue 2 than the  $OW_c$  value basis highlighted under Issue 1. TP-8 displays a unique sensitivity profile due to the apparent  $S_r$  value error highlighted under Issue 3.

At a minimum, the discrepancies highlighted above support the need for additional data collection to refine ESHGW conditions at the proposed development site using monitoring wells located in the vicinities of the proposed stormwater infiltration areas. Water levels within these monitoring wells should be measured and recorded to develop a data set that can be evaluated to establish more reliable and representative ESHGW conditions. Under this approach, water levels should be monitored at a high temporal frequency (i.e., using pressure transducers), and monitoring should span a minimum of a representative spring season based on an assessment of long-term groundwater monitoring records at the selected index well.

The review described herein is preliminary and based on information made available to MMA as of the indicated transmittal date. MMA therefore reserves the right to amend and/or extend this commentary based on expanded review and/or review of new information.

Sincerely,

A handwritten signature in black ink, consisting of a stylized 'M' followed by a series of loops and a horizontal line.

Michael Mobile, Ph.D., CGWP  
President, McDonald Morrissey Associates, LLC

MAM/

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